

CCC COUNCIL MEETING

November 29, 2017



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AGENDA

- Morning
 - Welcome and Introductions
 - Task Forces: PMLC, Privacy, Security
 - CISE Update and Looking Forward
 - Connections between CISE and SBE
- Lunch
- Afternoon
 - Task Forces: II, HTF, AI
 - CCC Planning: Looking Forward to 2018
 - Closing Discussions



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INTRODUCTIONS



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POST MOORE'S LAW COMPUTING TASK FORCE

Chairs: Mark Hill and Kathy Yelick

Mark Hill
Wisconsin,
Madison



Kathy Yelick
UC Berkeley



Current Members:

Tom Conte
Georgia Tech



Goal: The Post Moore's Law Computing task force leads activities to address the future of computing as we reach the limit of Moore's Law – the observable trend that the number of transistors per square inch on integrated circuits had doubled every year since their invention. In order to move past the era of Moore's law, new computational tools and systems must be developed.

Upcoming Activities:

- *3 workshops being planned: Quantum Computing, Specialized architectures, and brain-inspired (thermodynamic) computing*



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Workshop #1: Specialized Digital Computing

Co-Chairs: Christos Kozyrakis and Kathy Yelick

Christos Kozyrakis
Stanford



Kathy Yelick
UC Berkeley



Dates and location:

- *March 15-16, probably in Berkeley*

Goals:

- *As transistor density growth stalls, there will be a trend toward specialized architectures as one of the last ways to gain performance. Identify the open research questions in associated languages, compilers, algorithms, and operating systems; focus on problems suited to an academic research environment rather than industry.*

Approach: Use application-driven discussions organized around 3 case studies:

- 1) Machine learning beyond deep learning
- 2) Scientific simulation and analysis at extreme scales
- 3) Streaming image/video analysis from ubiquitous cameras

Use breakouts to identify research problems in the specialized software stack to inform funding agencies



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Workshop #2: Quantum Computing

Co-Chairs: Margaret Martonosi and Martin Roetteler

Margaret Martonosi
Princeton



Martin Roetteler
Microsoft (not confirmed)



Approach: Bring together experts in quantum computing with computer science system researchers to identify research areas in the gap between physics/device and theory/algorithms

Dates and location:

- *Late spring / early summer? Location TBD*

Goals:

- *Quantum devices with 10s of qubits are becoming available, both as cloud-attached resources and configurable testbeds, and there are some potential applications (chemistry, physics, machine learning, optimization) where a quantum device may soon outperformance conventional ones. Inform the computer science research community on the emerging quantum technology and roadmaps, and identify research problems in programming, etc.*



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Workshop #3: Thermodynamic Computing

Co-Chairs: Tom Conte and Todd Hylton

Tom Conte
Georgia Tech



Todd Hylton
UC San Diego



Goal: Make a position statement about the importance of advancing this area of research by highlighting the challenges and needs for advancement of these novel computing approaches.

Dates and location:

- *Late summer / early fall? Location TBD*

Goals:

- *Explore non-von Neumann computing approaches (beyond quantum and neuromorphic) to use physical processes to perform computation, e.g., thermodynamic models of cognition. Consider approaches that "unbox" the computer by leveraging and embracing the environment the computer is embedded in, rather than assuming IoT sensors send data to a cloud environment for computation.*



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PRIVACY AND FAIRNESS TASK FORCE

Chair: Elizabeth Bradley

**Elizabeth
Bradley**
Colorado,
Boulder



Goal: This task force addresses the important domains of privacy and fairness in an interconnected and big-data driven world.

Current Members:

**Cynthia
Dwork**
Harvard



**Sampath
Kannan**
University of
Pennsylvania



Upcoming Activities:

- *Planning a series of 2-3 workshops including one on fairness in March, 2018*



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CYBERSECURITY TASK FORCE

Chair: Kevin Fu

Kevin Fu
Michigan



Current Members:

Nadya Bliss
Arizona State



**Keith
Marzullo**
Maryland



**Greg
Morrisett**
Cornell



Goal: This task force aims to shed light on cybersecurity research and best practices, with a focus on cyber-physical systems and the Internet of Things in an increasingly connected world.

Upcoming Activities:

- *Looking to hold a workshop or write a white paper around embedded devices*



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CYBERSECURITY TF PLANS FOR 2018

- Formal methods for security (Morrisett; next: blog)
- Embedded security (Fu; next: NUL)
- Testing to failure (Fu, Hill; next: NUL)

Discussion:

- Democracy & Disinformation (next: blog reaction)
- AI and Security (Marzullo)
- Approximation algorithms (Bliss; fairness)

See What Happens:

- Quantum (Bliss)
- Data Breaches, Cyber Risk, Economics

BREAK



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CISE UPDATE AND LOOKING FORWARD

Jim Kurose, CISE AD



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CONNECTIONS BETWEEN CISE AND SBE

Howard Wactlar, CISE

Steven Breckler, SBE

Tamera Schneider, SBE

Sara Kiesler, SBE



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LUNCH



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HUMAN TECHNOLOGY FRONTIER TASK FORCE

Chairs: Maja Matarić and Shwetak Patel

**Maja
Matarić**
USC



Shwetak Patel
Washington



Current Members:

**Elizabeth
Churchill**
Google



**Beth
Mynatt**
Georgia
Tech



**Holly
Rushmeier**
Yale



Goal: The Human Technology Frontier task force focuses on the role of technology to augmenting human performance, including but not limited to, in the workplace, in the classroom, and to improve health outcomes.

Upcoming Activities:

- *Planning a workshop on Lifelong Learning / Training for HTF.*
- *Planning a whitepaper on Technology and Mental Health*



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WORKSHOP

Authoring Tools for Lifelong Learning *or* Content Creation for Education and Training

GOAL

Bring together:

Researchers in different areas of content creation tools
(systems for creating various time-based media)

Representatives of application domains where this media could be used in
education and training.

Application domains:

Manufacturing service industries, medicine, government
domains that are evolving rapidly with technology and require training tools.

Users have no intrinsic interest in developing computer expertise, but are focused
on their application.

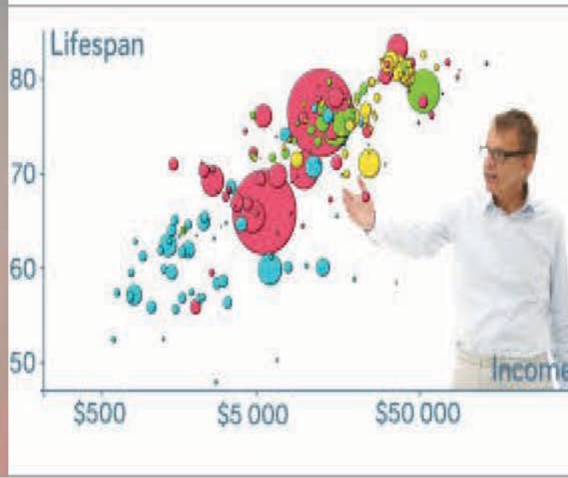
Authoring tools should blend in with their current work, rather than demanding
new skill sets.

Researchers:

Computer science and education technology

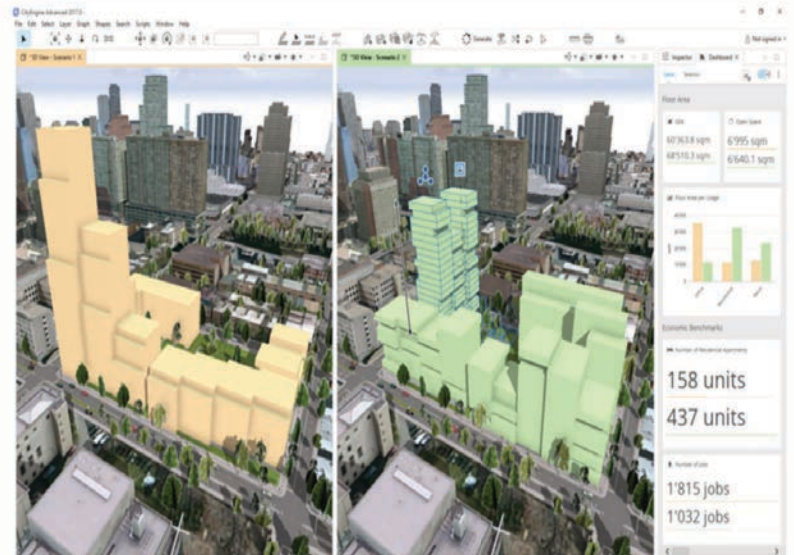
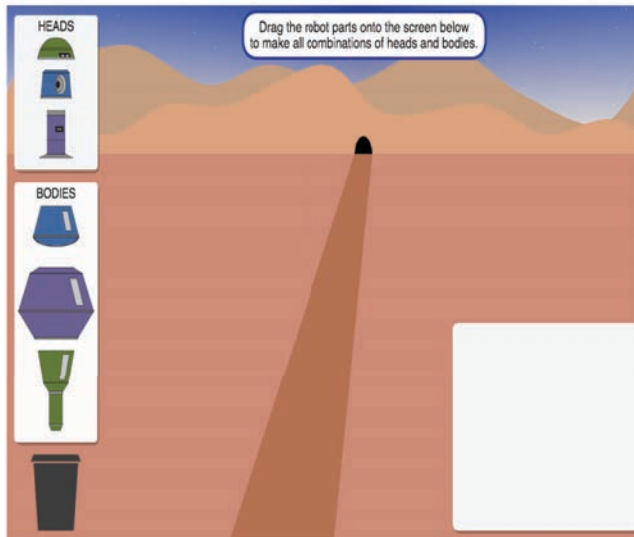
Focusing on new domains will inspire new approaches in authoring and result in

Examples of use:



Create visuals to assist (not replace) people in communication (images of Hans Rosling from Stockholm)

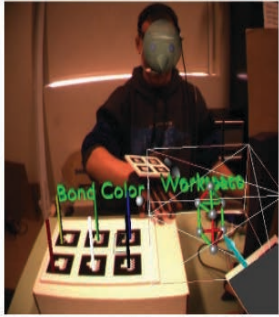
Tree of combinations



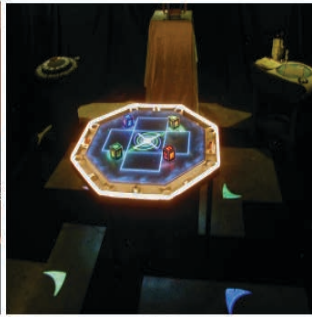
Create environments for comparing scenarios

Create interactive demos: Pixar in a Box Robot Combinatorics ESRI City Engine

Examples of toolkits:



(a)



(b)



(c)



(d)



(e)



(f)

Designer's Augmented Reality Toolkit MacIntyre GaTech

 Data-Driven Documents

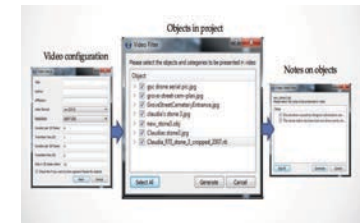
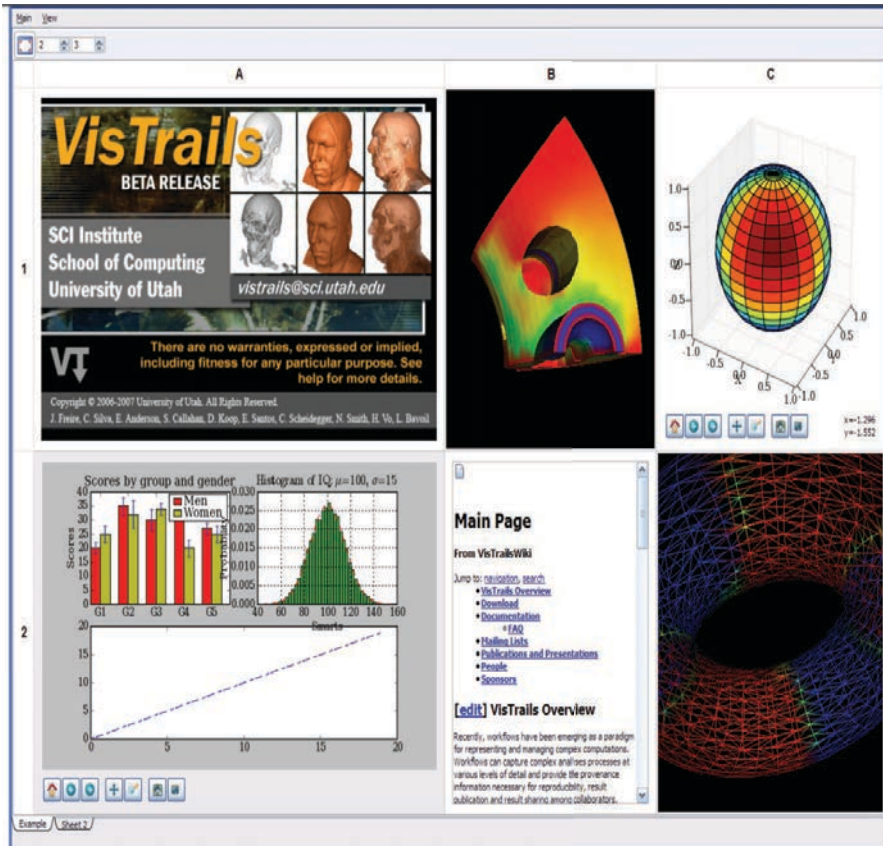
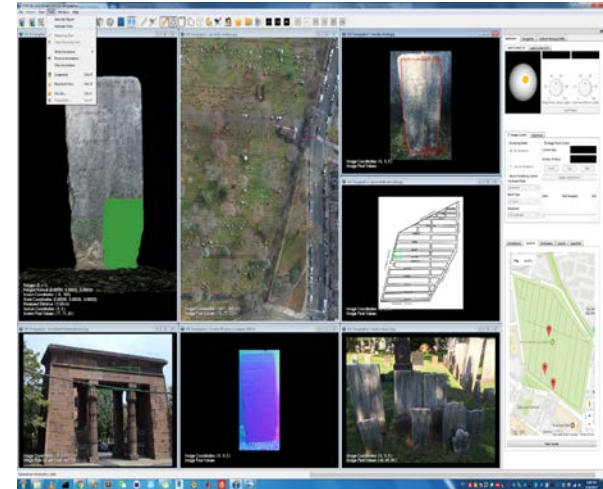


d3.js for data visualizations

Examples incorporated into analysis systems:

CHER-Ob video generator, NYU

VisTrails provenance management, NYU



Discoloration and material loss are the main decay forms. It is also possible to observe bending together with delaminations, if the stone is viewed from the sides closely.

End products:

The product that is authored could be a wide range of media including videos, AR and VR applications, games and other interactive media.

For the application domains, there would be a new interest in employing new media in education if the substantial learning curve for developing customized materials were flattened.

Fit with CCC goals:

Both top down (need for rapid training in face of technological advances)
And bottom up (new research in content creation)

Engage with ACM SIGGRAPH, SIGCHI and IEEE TVCG
Engage with industry

Steering committee members-

Jessica Hodgins (CMU, ACM SIGGRAPH president) (agreed)

Tony DeRose (Pixar) (agreed)

Blair MacIntyre (GaTech) (agreed)

Holly Rushmeier -- CCC liaison (graphics focus)

Juliana Freire -- CCC liaison (visualization focus)

Beth Mynatt – CCC liaison (HCI focus)

Educational Technology –

AI TASK FORCE

Chairs: Greg Hager and Manuela Veloso

Gregory Hager
Johns Hopkins



Manuela Veloso
Carnegie Mellon



Goal: Provide a mechanism for articulating both the state of the art and technical limitations of AI, to help develop forward-looking research agendas for the field, and to better understand the potential of AI to provide tremendous social good in the future, including but not limited to urban computing, health, environmental sustainability, and public welfare.

Current Members:

Eric Horvitz
Microsoft
Research



Maja Matarić
USC



Upcoming Activities:

- *Framing a workshop on Transparent and Trustworthy AI*
- *Planning a whitepaper on the continued need for Foundational Research in*
- *Thinking about the issues of workforce / education / training for AI*



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INTELLIGENT INFRASTRUCTURE TASK FORCE

Chairs: Dan Lopresti and Ben Zorn

Daniel Lopresti
Lehigh



Ben Zorn
Microsoft
Research



Current Members:

Nina Mishra
Carnegie
Mellon



Dina Katabi
Massachusetts
Institute of
Technology



**Jennifer
Rexford**
Princeton



**Henning
Schulzrinne**
Columbia
University



Goal: The CCC task force on Intelligent Infrastructure focuses on exploring the challenges and opportunities in the intersection between infrastructure, the Internet of Things, and other relevant technologies that are vital to the creation of smart cities and communities.

Upcoming Activities:

- *Planning a workshop (or series) around connectivity infrastructure resilience and reuse and disaster response.*



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CONGRESSIONAL BRIEFING

- II Task Force planning for possible briefing for House Committee on Science, Space, and Technology in January
- Important points to make:
 - II will have enormous economic and societal impact
 - II needs to serve all citizens and provide both public and private benefits
 - II needs to be “future-proof” because once we build it, we won’t have another change for 50 years
 - II needs to provide 4 important properties:
 - 1) Trustworthy
 - 2) Robust and Interoperable
 - 3) Resilient and Adaptable
 - 4) Accessible



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BREAK



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CCC PLANNING: LOOKING FORWARD TO 2018

Increase and Structure Communication

- Disseminate to known venues (e.g. ACM / IEEE)
- Structure writing (white papers, workshop reports, agency responses)
- Provide actionable collaterals (Exec summaries, Slides, Video)
- Target major media / press

Broaden Participation

- Increase reach to more universities / labs / researchers
- Increase interactions with early career researchers

Increase Engagement

- Professional societies
- Industry
- Advisory Board

Task Force Process and Topics

- Pick topics strategically with balance between top-down and bottom-up activities



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BLUE SKY IDEAS

CONFERENCE TRACKS

Recent

- Advances in Geographic Information Systems (ACM SIGSPATIAL)- **November 2016**
- Advancement of Artificial Intelligence (AAAI)- **February 2017**
- Autonomous Agents and MutliAgent Systems (AAMAS)- **May 2017**
- Material Robotics (MaRo) Robotics Science and Systems (RSS)- **July 2017**
- Spatial & Temporal Databases (SSTD)- **August 2017**

Future

- International Symposium on Robotics Research (ISRR)- **December 2017**
- Advancement of Artificial Intelligence (AAAI)- **February 2018**
- Association for Computational Linguistics: Human Language Technologies- **June 2018***
- ACM Hypertext- **July 2018***

* Not your typical Blue Sky, but using Blue Sky Funds

NEXT STEPS FOR CCC

Spring Meeting

Summer Meeting / Snowbird

Plans to write

- Engagement and Outreach Plan (2018)
- Site visit (April 2019)
- Strategic plan (April 2020)



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CLOSING DISCUSSIONS



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